Online Calibrations

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Overview

- It is the responsibility of the DAQ ace to run online calibrations once per day.
- "Online calibration"
  - Ace initiates some kind of "pulsing" for system
  - The "data" from the pulse is read out from the Front End Readout crates
  - "Data" used to form calibration constants, which are used to correct the data.

Offline vs. Online calibration

- This differs from “offline calibrations”, in which real data from collisions are used to find constants.
  - Systems need offline and online calibrations for different types of constants
  - Aces only responsible for the online calibration.

X-mode vs D-mode

- X-mode: Front-End crate processes data, forms constants, forms a calibration bank, sends calibration bank to consumer, consumer writes to DB
  - COT calibration
  - Calorimeter QIE calibrations
- D-mode: Data sent from FER crate to consumer, consumer processes data, forms constants, writes to DB.
  - Silicon

Hardware vs Software EVB

- Standard data taking is done with the "Hardware" Event Builder.
- Most online calibrations (exception: Silicon) are done with the "Software" Event Builder
  - Software EVB connects to Consumer Server/ Logger
  - CSL connects to the Calibration Consumer

Pulsing

- Generally, it is not the detector itself which gets “pulsed”, but its readout electronics:
  - Calorimeter:
    - QIE: Charge injected into QIE
    - LED/Xenon: Light into Phototubes
  - COT: Charge injected into ASDQ readout card
- Exception: Calorimeter source runs. But you’ll never do these!!!

List Of Calibrations

- Calorimeter
  - QIE (CEM,CHA,PEM,PHA,WHA)
  - LED (CEM)
  - Xenon (CEM)
  - Laser (Plug)
    - No consumer yet – expert reads D-banks from disk
- CLC: QIE
- BSC+Miniplugs: QIE
- COT: CotCtt
- Muons (pulses CMP, CMX, BMU, *not* CMU)
  - No consumer, expert reads D-bank from disk

Calibrations (continued)

- ShowerMax (central, plug)
- Roman Pots
- TOF
  - QIE (to calibrate pulse heights)
  - TAC
    - To calibrate timing
    - No consumer yet, expert reads D-banks from disk
- Silicon
  - Two runs needed: DPS on (pedestals), DPS off (noise)
  - Currently D-mode: X-mode calibrations coming soon

Running Calibrations

- Mostly consists of choosing correct run configuration, going through state transitions
- Will give example here for COT and QIE
- Other calibrations, see Ace help:

www-b0.fnal.gov:8000/ace2help/ace_calibrations.html

“Quiet Time”

- Some calibrations require absolutely no beam in the Tevatron
- Best time is usually immediately after store has ended
  - SciCo should confirm with MCR about “Quiet time”
  - ~20 min are sufficient for QT calibrations (usually cannot do Plug Laser)
- If there hasn’t been any quiet time for >5 shifts, SciCo can request some after a store

Picture of COT Calib Path

ACE initiates Calibration:

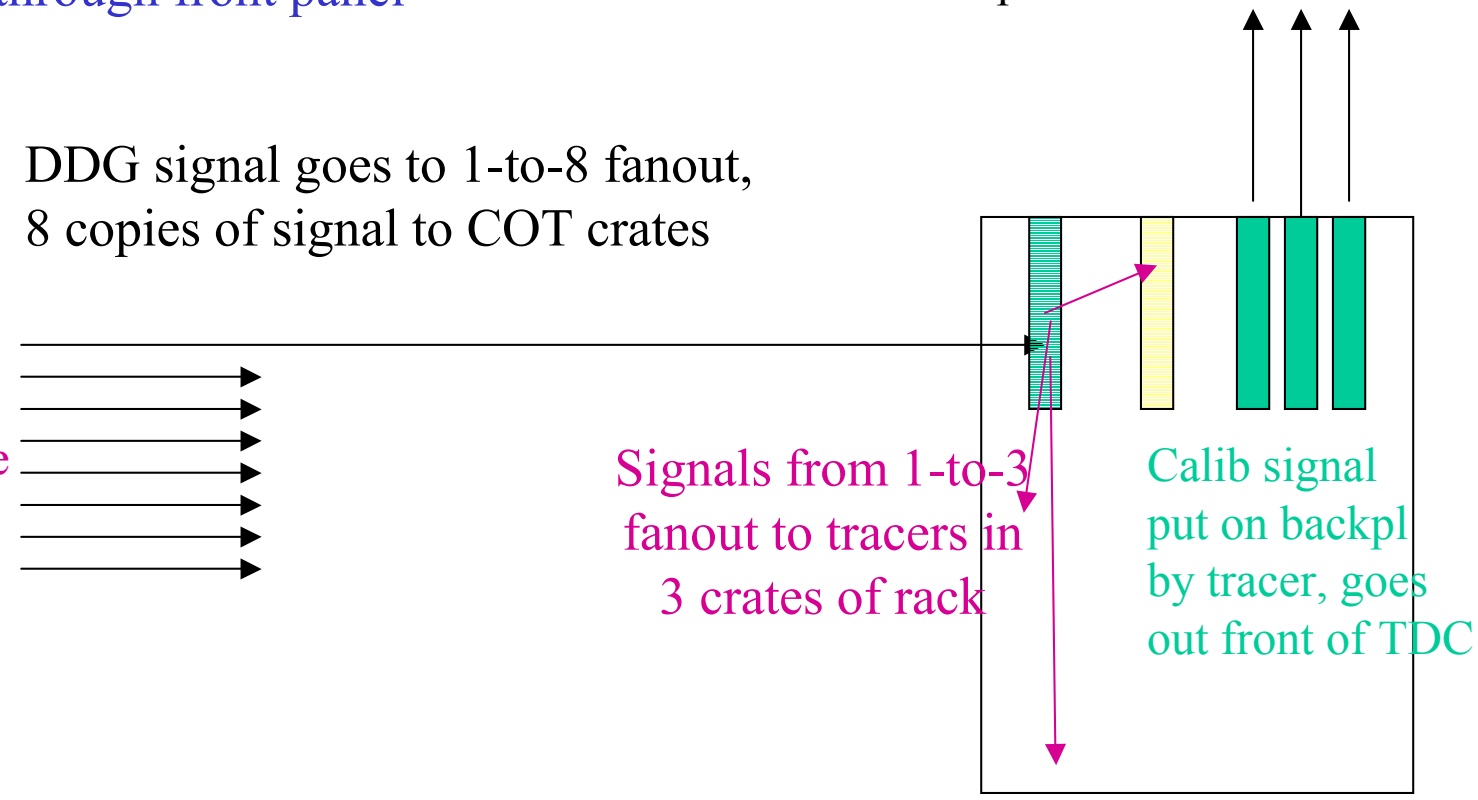
Signal from TS goes to tracer, picked up by CIC (6-to-9 U adapter) which triggers DDG through front panel

Calib signal goes down flat cable/repeater/micro-coax to ASDQ, fires special circuitry on ASDQ which injects charge into readout part of ASDQ, "data" read out thru normal path of micro-coax/repeater/flat cable/TDC

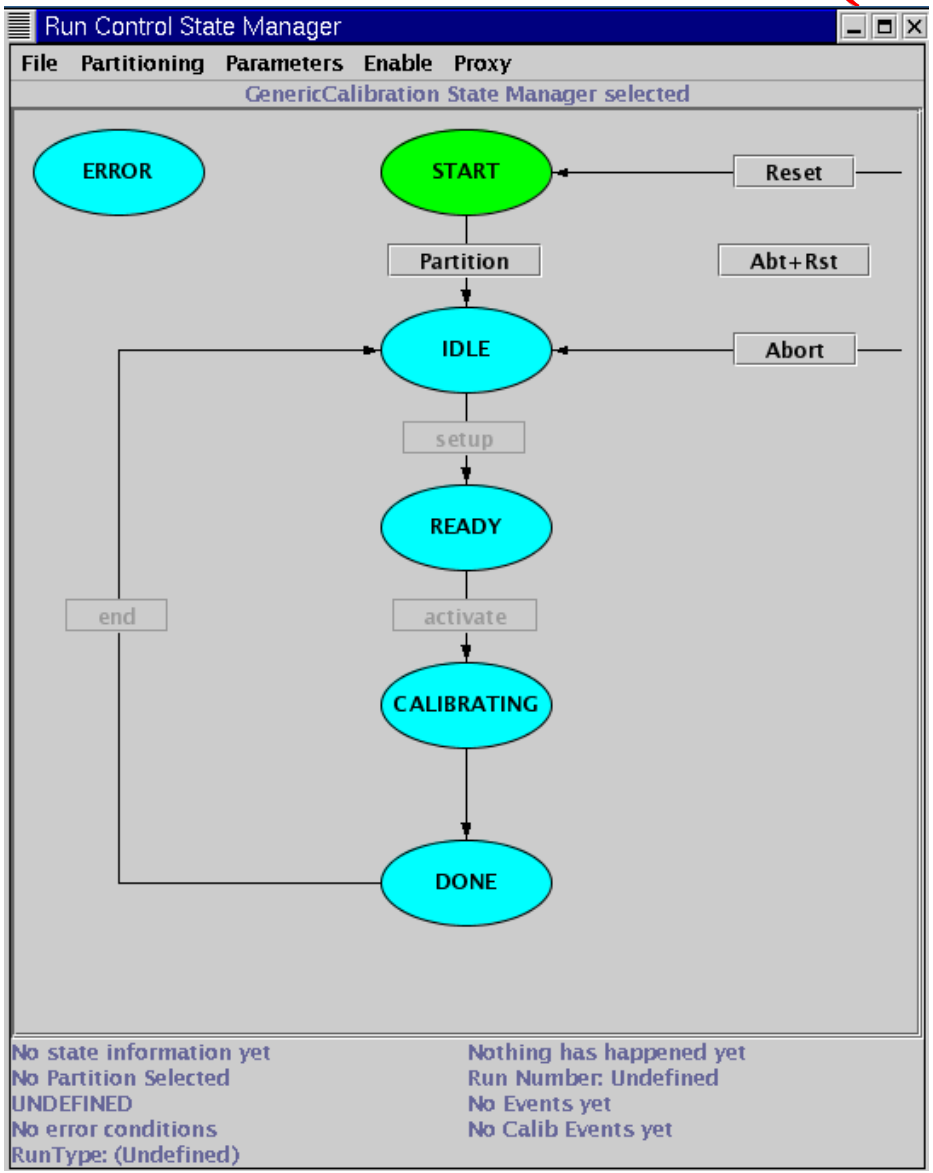
b0puls00,
On 2nd flr

DDG+CIC,
1-to-8 fanout
both in this crate

DDG signal goes to 1-to-8 fanout,
8 copies of signal to COT crates



Picture of Calib GUI (COT)

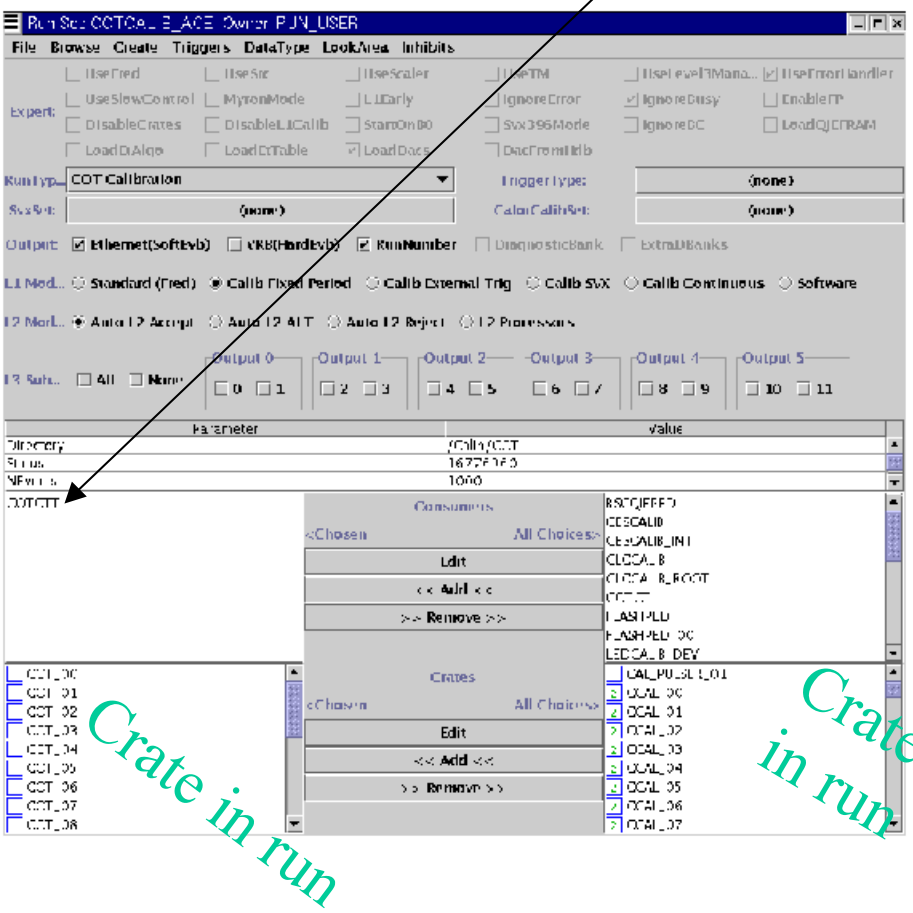


How to run calibration (COT)

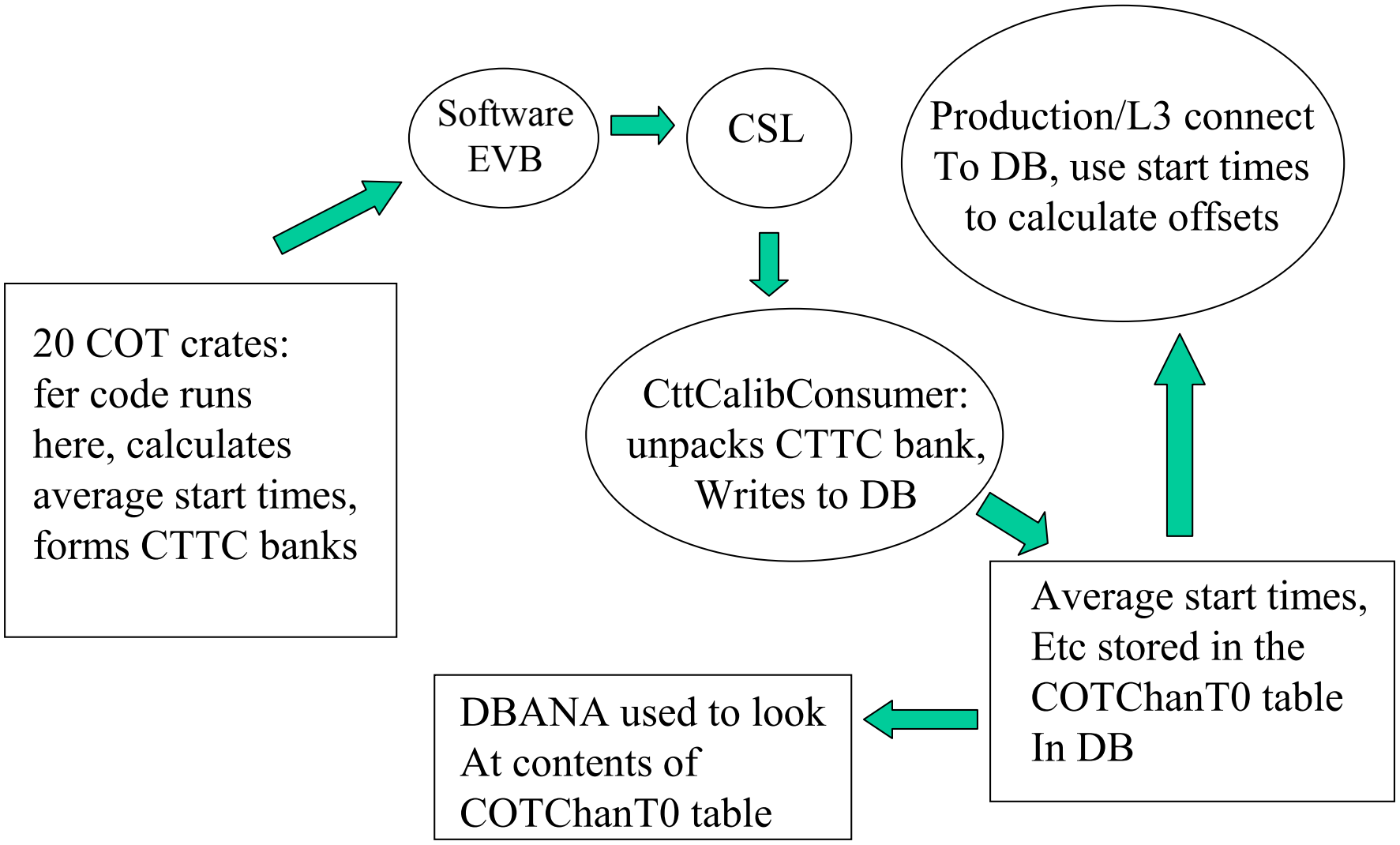
- Start run control
- Select state manager: “generic calibration”
- Choose a partition
- Select run configuration:
  - calib → cot → COTCALIB_ACE
- Do Partition → setup → activate. This is what fires the pulser!
- Calibration will take a minute or so. After pulsing is done, CTTC bank formed and sent to SEVB, then to consumer. Will take consumer another minute or so to write data to COTChanT0 table.

Config for COT Calib

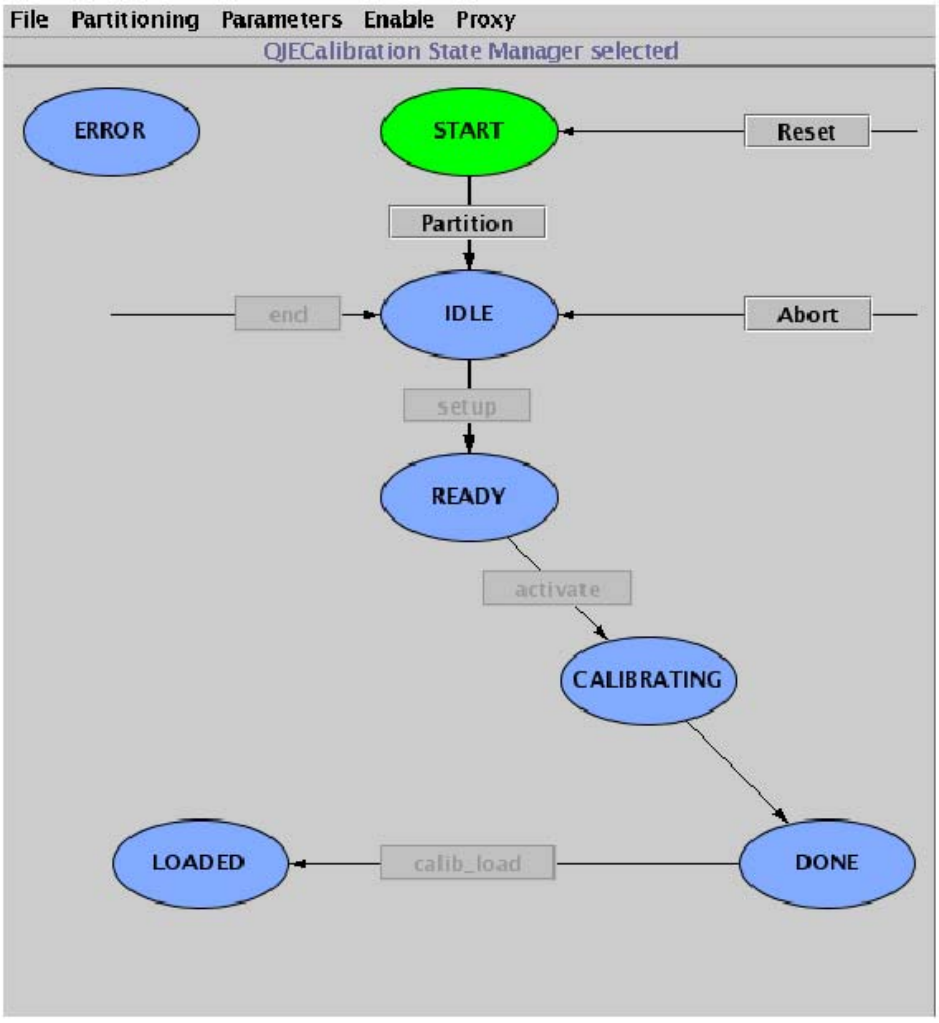
COT calibration consumer



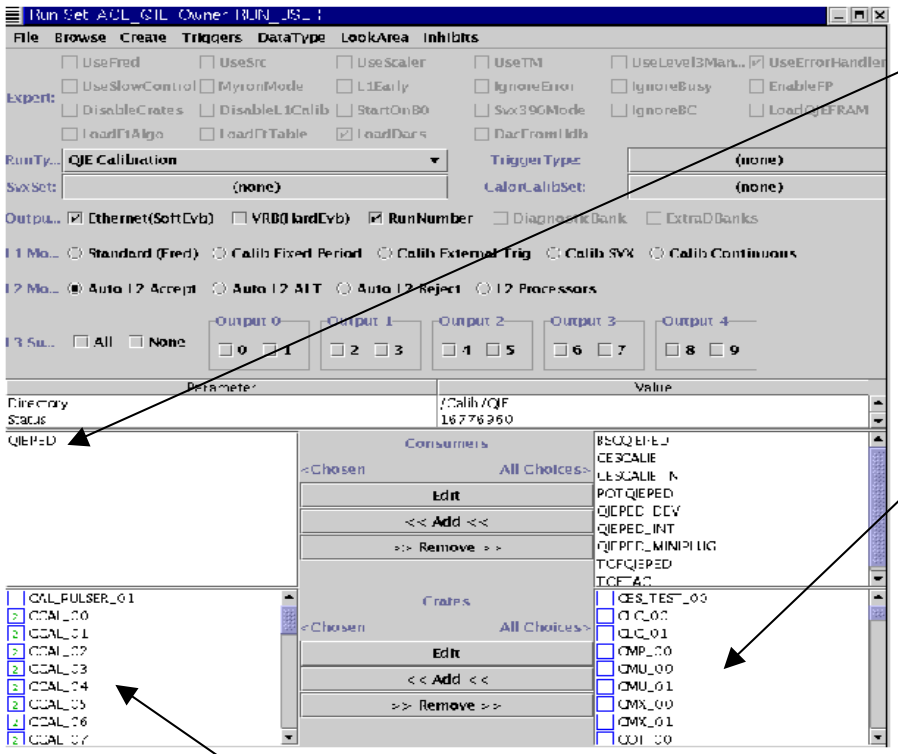
Picture of Calibration chain (COT)



QIE calibration GUI



Configuration for QIE calib



Qie calib consumer

Crates not in run

Crates in run

Where are constants applied?

- COT: constants read from database and applied at L3/offline
- Calorimeter:
  - QIE: constants applied in the readout electronics
    - Run control has extra button, “download”
    - You’ll rarely (maybe never) use this
- Muons: just used for expert monitoring

Checking Calibrations

- Use DBANA to verify calibration made it into database
  - ~cdfcalib/runDBANA
- Should see the calibration run listed
- Note: COT calibration only writes new COMPLETE run if the new calibration changes from last COMPLETE run
  - Otherwise, just writes the BAD channels

Calibration Tables

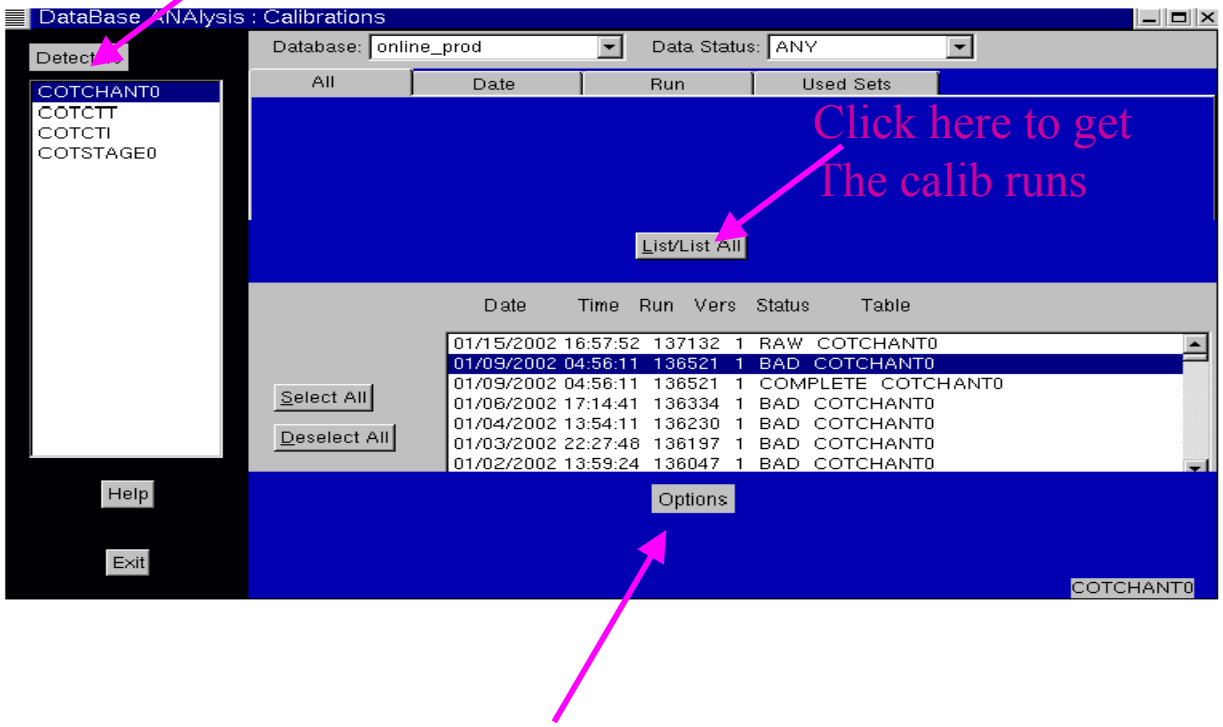
- From Qie calibrations:
  - CEMQIE2, CHAQIE2, PEMQIE2, PHAQIE2, WHAQIE2, CEMPED, CHAPED, PEMPED, PHAPED, WHAPED
  - CLACQIE2, CLAPED (CLC)
  - FDAQIE2 (BSC)
- From LED: CEMLED
- From Xenon: CEMXEF
- From Plug Laser: PHALASER

Calibration Tables (cont)

- From COT: COTChanT0
- From ShowerMax:
  - CESQIE2, CPRQIE2, CCRQIE2, PESQIE2, PPRQIE2, PESQIE2, CESPED, CPRPED, CCRPED, PESPED, PPRPED
- From TOF:
  - TOFQIE, TOFQIEPED
- Silicon tables not listed here

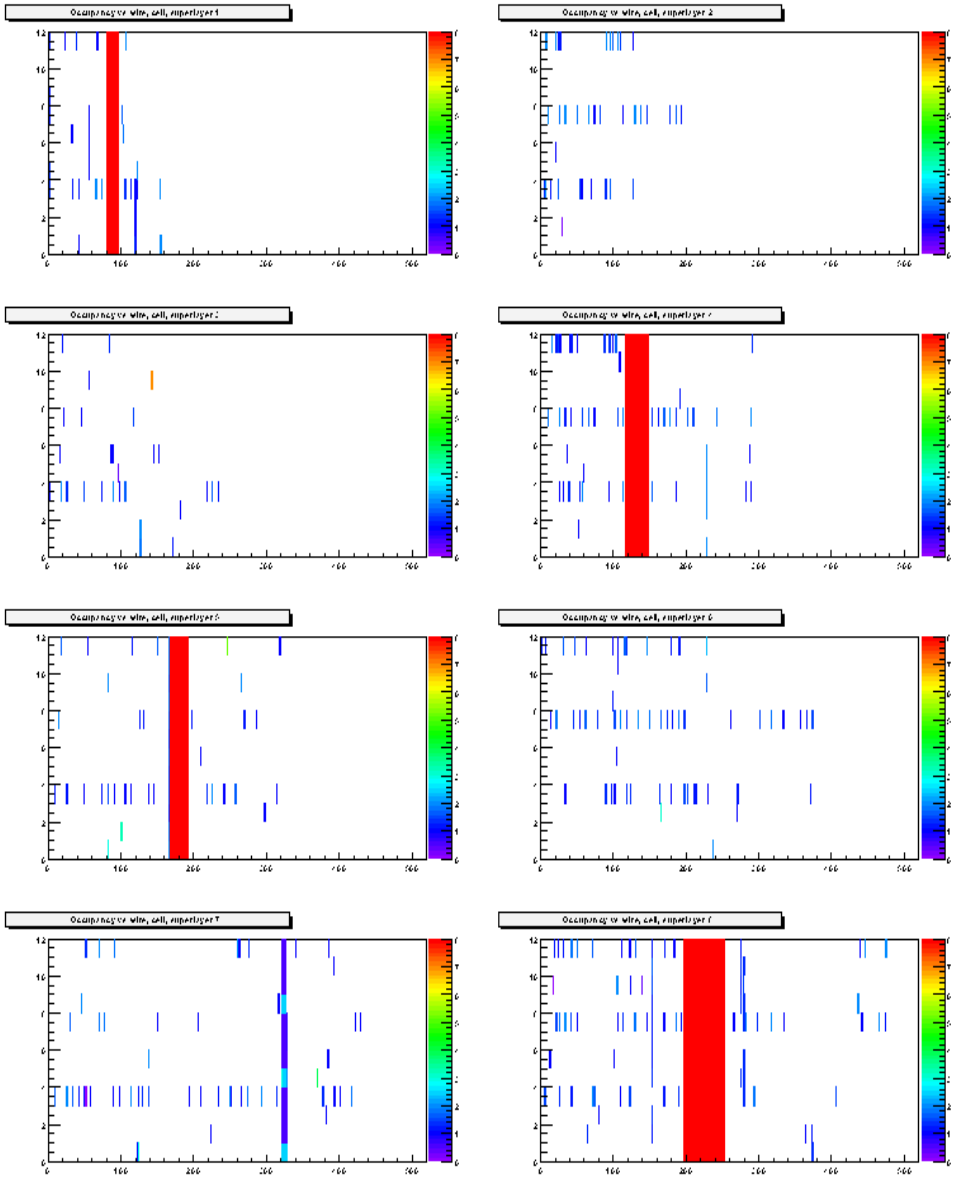
DBANA

Click on “Detectors” for specific detector, click on that detector to get the tables from the calibration



This will give list of options for plots

For more example
From more detectors
See the ACE calib
Help page



Plot of COT occupancy by superlayer, for the bad channels. Occupancy Should be 1 for each channel for the calibration

Troubleshooting

- Software EVB may not be running
  - Can be stopped/started from rc: Proxy → SoftEVB
- Persistent problem with crate (calibration fails during run)
  - Call expert
  - If there is a problem with a crate, probably already showed up during the data taking
- Calibration does not show up in the database
  - Check log file on b0dapNN: ~cdfdaq/consumers/log (do ls –ltr to check for latest log file. Will have name such as "runCotCtt_1******.log"
  - Record any errors in e-log, send email to expert.
- Online and Offline software do not cohabitate well
  - Always use separate xterms for online (rc etc.) and offline (DBANA) tasks